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**NAVAL PERSONNEL AND TRAINING
RESEARCH LABORATORY
SAN DIEGO, CALIFORNIA 92152**

RESEARCH MEMORANDUM SRM 71-10

FEBRUARY 1971

**THE DEVELOPMENT OF AN S'IB SCALE FOR PREDICTING
DISENROLLMENT FROM THE NROTC (REGULAR) PROGRAM**

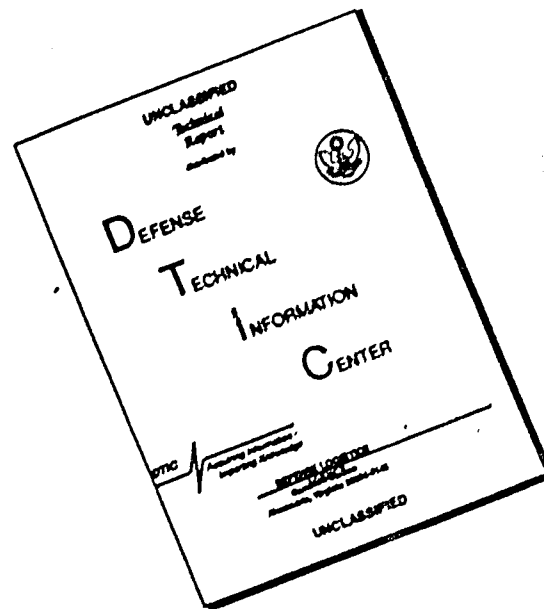
Idell Neumann
Norman M. Abrahams

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SUMMARY

A. Problem

In the past few years, the NROTC (Regular) midshipmen have been voluntarily disenrolling from the program in increasing numbers. The increasing disenrollment rate results in fewer midshipmen receiving commissions and reduces the pool of potential career officers. This, coupled with the substantial monetary loss when a midshipman disenrolls, requires the selection of those applicants most likely to remain in training and elect a naval career.

B. Background

Since 1964, the Strong Vocational Interest Blank (SVIB) has been routinely administered to all applicants for an NROTC (Regular) scholarship as a means of identifying those who are career motivated. The success of this effort suggested possible use of the SVIB as a means of predicting completion of NROTC college training.

C. Approach

Using data from the entering classes for the years 1964-1967, several scales were constructed by contrasting the SVIB responses of midshipmen remaining in the program with those disenrolling for various reasons (motivational, academic, etc.). These scales were evaluated on a similarly constituted holdout sample.

D. Findings, Conclusions, and Recommendations

A cross-validated biserial validity coefficient of .20 was obtained for the best empirical scale between disenrollment for any reason and remaining in the program (page 5). Under favorable conditions, this scale could eliminate 80 potential disenrollees from a starting class of 1,350 midshipmen (page 5). Such a decrease in attrition could produce a monetary saving of approximately \$300,000 per year (page 10).

To determine the actual contribution that use of the SVIB would make, the relationships between the disenrollment scale and present selection scores are being determined. This analysis will permit recommendations to be made for the operational use of the disenrollment scale.

THE DEVELOPMENT OF AN SVIB SCALE FOR PREDICTING DISENROLLMENT
FROM THE NROTC (REGULAR) PROGRAM

Idell Neumann
Norman M. Abrahams

February 1971

521.005.01.04
Research Memorandum SRM 71-10

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Naval Personnel and Training Research Laboratory
San Diego, California 92152

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THE DEVELOPMENT OF AN SVIB SCALE FOR PREDICTING DISENROLLMENT FROM THE NROTC (REGULAR) PROGRAM

A. BACKGROUND AND PURPOSE

Since 1964, the Strong Vocational Interest Blank (SVIB) has been routinely administered to all applicants for a Naval Reserve Officers Training Corps (NROTC) Regular scholarship. An empirically derived scale for predicting retention has been used in selection of scholarship applicants since 1965 (Abrahams, Neumann, & Githens, 1968). As favorable validity evidence has accumulated, the scale has been given increasing weight in the selection decisions. Even though this scale was originally designed only to predict post-commissioning tenure, it was also found to discriminate very significantly between differentially motivated midshipman groups during NROTC training. That is, the NPOTC midshipmen who transferred to the Naval Academy obtained the highest scores, the midshipmen dropping at their own request obtained the lowest scores, with the remaining midshipmen obtaining intermediate scores. These results suggested that a special scale could be constructed to predict program completion with even greater efficiency. And, since the disenrollment rate in recent years has been high, an effective disenrollment scale would be highly desirable. The purpose of this report is to describe the procedures followed in constructing such a scale and to present the relevant validity information available at this time.

The relationships between the disenrollment scale and the presently used selection variables (the Navy College Aptitude Test (NCAT), High School Rank (HSR), the Strong Vocational Interest Blank/Background Questionnaire (SVIB/BQ) officer retention score, and the Interview Rating) are being investigated and will be presented in a subsequent report.

B. POPULATION AND CRITERION

The scholarship selectees included in these analyses completed the SVIB at the time of application in the years 1964-1967, inclusive, and subsequently enrolled in the NROTC program. Data from the more recent years could not be used since a sufficient time had not elapsed for the necessary identification of disenrolled and remaining midshipmen.

In November 1969, both the NROTC Master Active and Attrition tapes were searched to obtain disenrollment information. Table 1 presents the number of midshipmen by criterion status and year for whom SVIB responses were readily available. In the discussion that follows, classes will be referred to in terms of the year in which the SVIB was administered.

TABLE 1

Numbers of Selected NROTC Applicants by Criterion
Status and Year Tested

Criterion Status ^a	Year in which SVIB was administered				Totals
	1964	1965	1966	1967	
<u>HIGH</u>					
Remaining Class	35	272	228 ^b	1012	1547
Commissioned Officers	680	751	25	11	1467
Academy Transfers	12	14	22	20	68
Total	727	1037	275	1043	3082
- - - - -					
<u>LOW (Disenrollees)</u>					
Motivational	185	158	291	386	1020
Academic	190	246	235	156	827
Others	111	123	58	55	347
Total	486	527	584	597	2194
- - - - -					
Total Sample	1213	1564	859	1640	5276

Note.--

^aCriterion status was obtained in November 1969.^bSVIB answer sheets for 1966 testing were not machine processable. Since manual key-punching was costly and time-consuming, all disenrollees were included but only a sample of the remaining class was used.

C. INSTRUMENT

The 1964 edition of the SVIB, containing 405 items, was used in the years 1964, 1965, and 1966. Use of the 1966 revised edition was begun in 1967. This change necessitated limiting the items available for analysis to those which were either unchanged or altered only slightly. A total of 368 items met these standards and, with three possible responses provided for each item, a pool of 1,104 item responses was available for analyses.

D. PROCEDURE

1. Preliminary Analyses

Two preliminary analyses were necessary prior to key development. First, it seemed essential to examine SVIB Basic Scale profiles before combining year groups to ensure that the four classes were similar enough to be combined. Since no two classes differed by more than two standard score points and two point differences occurred on only three scales, it seemed reasonable to combine the four year groups into a single sample. Second, since the criterion data were collected in November 1969, some of the midshipmen remaining at that time would ultimately disenroll. Thus, potential drops would contaminate the "remaining class" criterion and reduce the discriminating power of the scale. However, if it were known that the majority of disenrollees had already left, the remaining class could be used in the high criterion group with greater confidence.

To examine this question, distributions of disenrollment dates for the academic, motivational, and other disenrollees of the 1964 class were prepared. The proportions of disenrollees were computed at various points along the disenrollment date distributions. In this way, it was possible to determine, at any point in time, what proportion of the total of each type of disenrollment had already occurred. Using these distributions to project for the most recent class, it was estimated that by November 1969, 77 per cent of the academic and 89 per cent of the motivational disenrollments of the 1967 class had already occurred. Again, using the 1964 class for such projections, it was estimated that 89 per cent of the 1967 class remaining as of November 1969 would complete the program. Of the 11 per cent estimated disenrollees, it was expected that 2.4 per cent would disenroll for motivational reasons, 5.3 per cent for academic reasons, and the remaining 3.3 per cent for miscellaneous reasons, such as inaptitude, disciplinary, or physical. These results supported the inclusion of the 1967 remaining class in the high criterion group. Since an even greater portion of the eventual drops for the 1965 and 1966 classes could be assumed to have already disenrolled, it clearly follows that their remaining classes also meet the requirements for inclusion in the high criterion sample.

2. Key Construction and Validation

The entire sample was split into equal subsamples, stratified by disenrollment and high criterion categories, for key construction and cross-validation purposes. Three experimental scales were constructed on the key-construction samples by contrasting the responses of each of the three disenrollment groups with the responses of the high criterion group, which consisted of all those who had either received their commissions or who were so advanced in the program that they had an extremely high likelihood of completing the program. Since the sample sizes were quite large, item responses with a seven per cent or greater difference were included in each of the three experimental scales. Validities were obtained on the cross-validation samples, and for those scales showing the most promise, expectancy charts were constructed in which the frequencies were adjusted to reflect present disenrollment rates. In addition, dollar savings were computed based on the expected reduction in number of disenrollees, under various selection ratios.

E. RESULTS AND DISCUSSION

A number of experimental scales were constructed and evaluated to obtain the predictive measure that best differentiated between disenrollees (for any reason) and remaining midshipmen (almost half of whom had already received their commissions). Using one half of each criterion group for key construction, the following scales were obtained with the same half of the high criterion group in each case but with different low criterion samples:

(1) Motivational. The item responses for midshipmen who voluntarily disenrolled from the program were contrasted with those of the high criterion group, resulting in a scale of 47 item responses having a seven per cent or greater difference between the criterion groups.

(2) Academic. Midshipmen who were disenrolled for academic reasons comprised the low criterion sample for this scale. In this instance, a total of 28 item responses were identified that met the seven per cent or greater criterion for item selection.

(3) All Disenrollees. A scale intended to be useful in predicting any type of disenrollment (irrespective of reason) was developed by using a low criterion group consisting of all types of disenrollees. Due to the heterogeneity of this grouping, only 10 items met the seven per cent criterion.

(4) Motivational-Academic. Since the motivational and academic drops represented the largest portion of the total disenrollment sample, the final experimental key simply combined the items from the Motivational and Academic scales. Three item responses were common to both scales and one item response, keyed in opposite directions, was dropped, resulting in a combined scale of 70 item responses.

Table 2 presents the means, standard deviations, and biserial validity coefficients for various disenrollment categories on the holdout samples. The level of significance is presented for each of the biserial validity coefficients (Alf & Abrahams, in press). Since eight of the 12 comparisons between the remaining class and various disenrollment categories were significant beyond the .01 level, it may be concluded that the SVIB can be used to identify applicants likely to disenroll from the NROTC program.

The Motivational and the Motivational-Academic scales are the most predictive when all disenrollees are considered as a group ($r_b = .20$). As expected, the Motivational Scale provides the best discrimination between those who voluntarily disenroll and those who remain in the program ($r_b = .24$). In contrast to its relatively high validity for predicting motivational disenrollment, this scale does the poorest job of identifying academic drops ($r = .05$). Although the Academic Scale is most valid for academic drops ($r_b = .17$), it cannot be used to identify motivational drops ($r_b = .02$). However, the combined Motivational-Academic Scale provides an acceptable compromise between the individual scales, with no loss in validity when all the disenrollees are combined ($r_b = .20$). The All Disenrollee Scale is only slightly less predictive than the Motivational-Academic Scale, but, because of the shortness (only 10 item responses), use of this scale seems inadvisable.

To provide additional decision-making information and to assess the practical advantages of using one of these experimental scales for selection purposes, expectancy charts were constructed. Figures 1 and 2 present the percentage of all disenrollees one could expect in various score categories for the Motivational, and the Motivational-Academic scales, respectively. Comparing the two charts, there seems to be only a negligible difference in the two top score categories. However, the remaining three score categories seem to favor the use of the Motivational-Academic Scale. To provide a better basis for choosing between the two scales, further comparisons were made by determining the consequences of using each scale and of using no scale at all, under various selection ratios (see Table 3). For example, if it were necessary to select the top 60 per cent from a pool of qualified applicants, one could expect to eliminate 80 more disenrollees by using the Motivational-Academic Scale than with no SVIB scale at all. A savings of 54 disenrollees would result if the Motivational Scale were used. The additional savings of 26 disenrollments demonstrates the superiority of the combined scale.

Although the exact cost of commissioning an officer through the NROTC (Regular) program varies from school to school, it has been estimated at somewhere between \$10,000 and \$12,000 per man, or approximately \$2,500 - \$3,000 per school year. If one were to assume that of the 80 men potentially retained by using the Motivational-Academic Scale, approximately one-half might have left sometime during their

TABLE 2

No. Means, Standard Deviations, and Biserial Validity Coefficients for
NEOTC (Regular) Cross-validation Sample^a

Scale	Criterion Group									
	High Remaining Class (N=1541)					Low				
			Motivational (N=510)			Academic (N=413)				
	\bar{X}	S.D.	\bar{X}	S.D.	r_b	\bar{X}	S.D.	r_b	All Disenrollees (N=1067)	
1. Motivational	101.12	6.37	98.55	6.52	.24**	100.60	6.19	.05 N.S.	99.08	6.51 .20**
2. Academic	97.94	4.33	97.69	4.48	.02 N.S.	96.52	4.45	.17**	97.46	4.47 .05 N.S.
3. All Disenrollees	99.94	2.09	99.26	2.17	.19**	99.30	2.07	.17**	99.31	2.20 .18**
4. Motivational- Academic	98.30	6.81	95.77	7.09	.22**	96.76	6.92	.13*	96.08	7.06 .20**

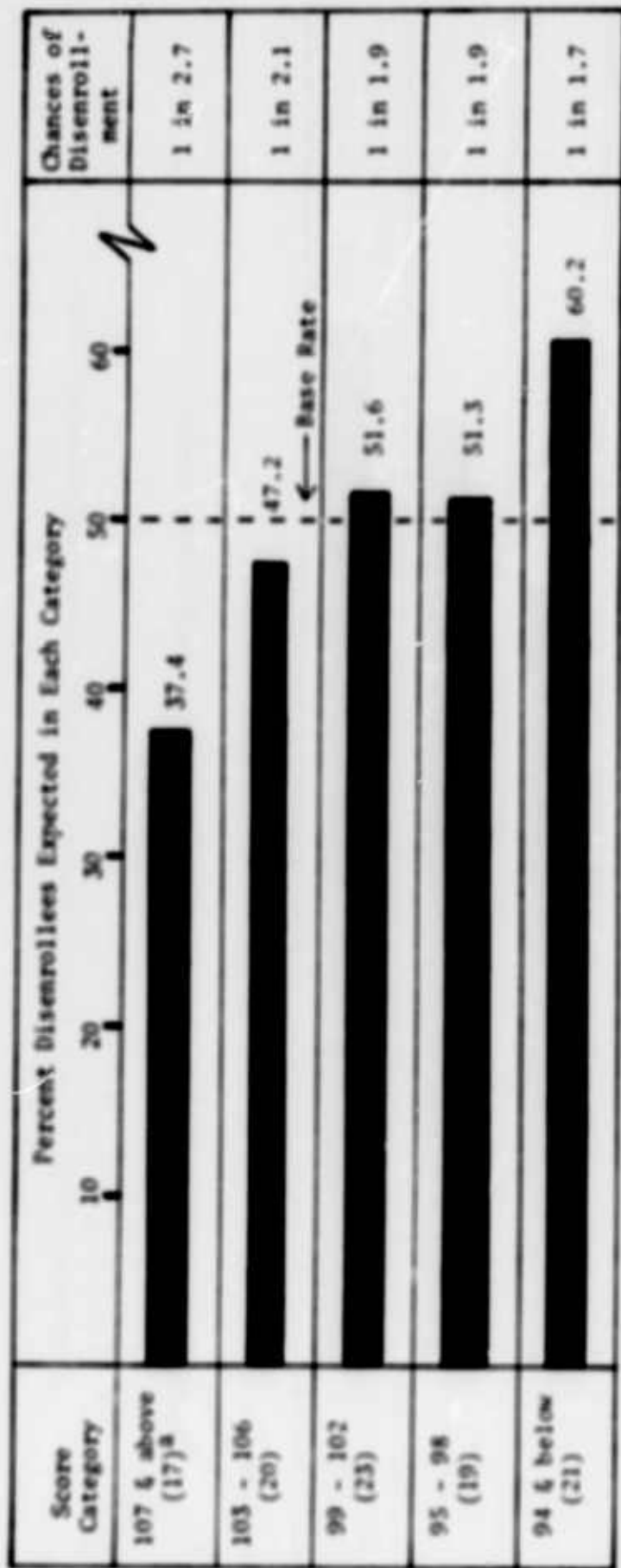
Note.--

^aThe sample consists of entering classes for the years 1964-1967, inclusive.

^bBiserial correlations are computed on high and low criterion groups and are based on frequencies adjusted to reflect the current disenrollment rates.

* r_b significant beyond the .05 level.

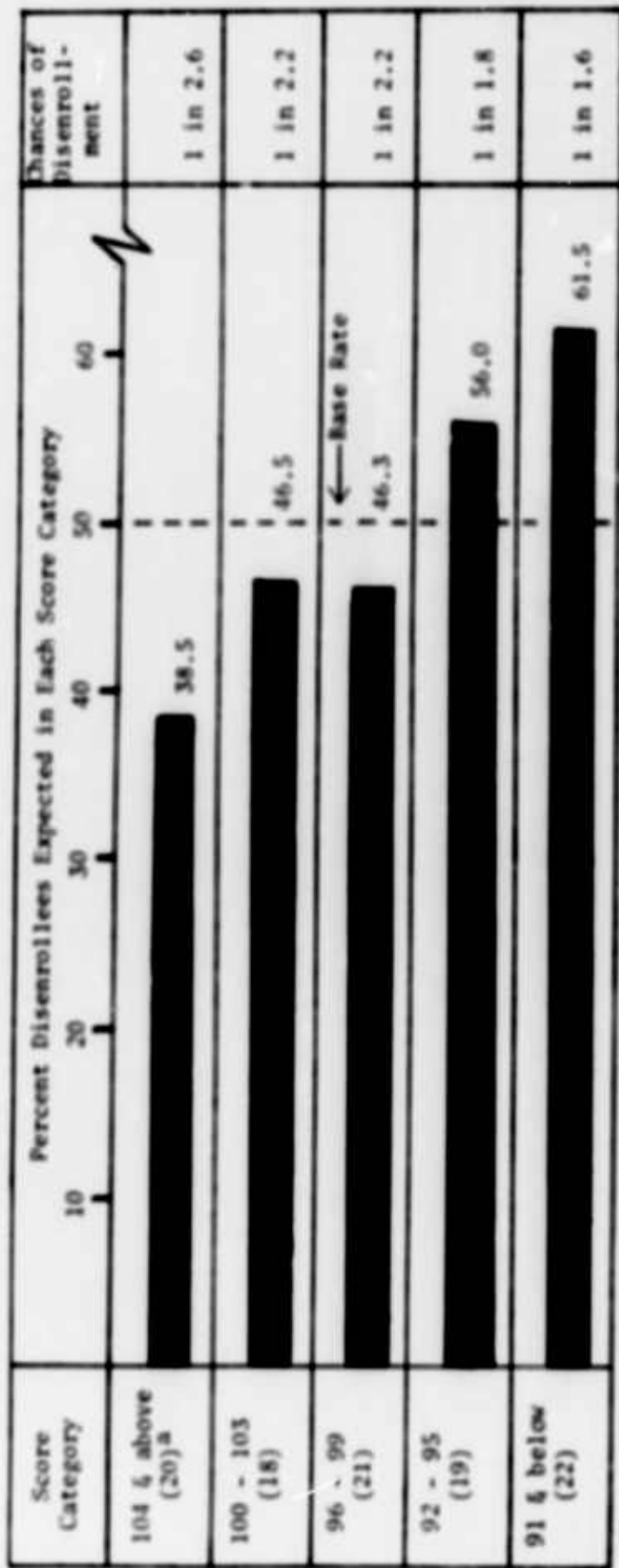
** r_b significant beyond the .01 level.



Note.--

^aNumbers in parentheses refer to percentage of total in each score category.

Fig. 1. Expectancy chart for all disenrollees on the MDIC Motivational Scale.



Note:--

^aNumbers in parentheses refer to percentage of total in each score category.

Fig. 2. Expectancy chart for all disenrollees on the NPTC Motivational-Academic Scale.

TABLE 3

Expected Number of Discenrollees for Two Scales Under Various Selection Ratios

Selection Ratio ^a	Without Scale			With Scale				
	Base Rate	Discenrollees Expected	Number	Motivation		Academic		
				Base Rate	Discenrollees Expected	Base Rate	Discenrollees Expected	Savings ^c
.20	.500	675 ^b		.385	520	.385	520	155
.40	.500	675		.431	582	.426	575	100
.50	.500	675		.450	607	.430	560	95
.60	.500	675		.460	621	.441	595	80
.80	.500	675		.474	640	.470	634	41

Note:--

^aLinear interpolation was used when score distributions did not permit partitioning at the exact points representing these selection ratios.

^bThe number of expected discenrollees is based on an estimated class size of 1,350 midshipmen.

^cThe "savings" columns present the difference in the number of discenrollees expected when using and not using the scale, e.g., with the Motivation scale and a selection ratio of .40, 675-582 or 93 fewer discenrollees would be expected.

first year in the program and the remaining half somewhere during and beyond the second year. This results in an estimated saving of approximately \$300,000 per year. With a more favorable selection ratio, the yearly savings would be considerably greater.

As previously stated, analysis of the relationship between the disenrollment scale and the present selection scores is underway. This analysis will permit recommendations to be made for the operational use of the disenrollment scale.

F. SUMMARY AND CONCLUSIONS

Ongoing research has established the validity of the SVIR in assessing motivation for a career as a Navy officer. The success of the original SVIR key, which was constructed by using career decisions of commissioned officers as a criterion, suggested that a special scale could be developed to improve prediction of pre-commissioning attrition in the NROTC program. Because of the increasingly high disenrollment rates and the need to identify such disenrollees became more important, such a scale was constructed on data from NROTC classes 1964-1967 (N-5276).

A cross-validated biserial validity coefficient of .20 for this empirical scale was obtained between disenrollment for any reason and remaining in the program. Assuming that the scale could be applied to applicants qualifying on other selection variables with a selection ratio of .60, it was estimated that 80 potential disenrollees could be eliminated from a starting class of 1,350 midshipmen through use of the new scale. Such a decrease in attrition would produce a monetary saving of approximately \$300,000 per year.

The potential benefits of adding this disenrollment scale to the presently used selection variables are currently being investigated. Upon completion of these analyses, recommendations will be made for incorporating the new scale into the operational selection program.

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- Abrahams, N. H., Neumann, I., & Githens, W. H. The Strong Vocational Interest Blank in predicting NROTC officer retention: Part I. Validity and reliability. San Diego: U. S. Naval Personnel Research Activity, January 1968. (Technical Bulletin STB 68-7)
- Alf, E. & Abrahams, N. A. Significance test for biserial r. Educational and Psychological Measurement, 1971, in press.

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